

**Application No.: 10/571507**  
**Filing Date: March 10, 2006**

## **REMARKS**

In response to the Office Action, Applicant respectfully requests the Examiner to reconsider the above-captioned application in view of the foregoing amendments and the following comments.

### **Discussion of the Claim Rejections Under 35 U.S.C. § 112**

Claim 1-5, 9-10, and 19-21 are rejected under 35 U.S.C. § 112, second paragraph, as being indefinite. The Examiner asserted “it is unclear what are the metes and bounds of the compositions being claimed, whether a concentrate is being claimed and what is the scope of the viscosities.” The claim 1 has been amended as the Examiner suggested so as to conditionally state the viscosity property. Applicant respectfully requests the withdrawal of the rejection.

### **Discussion of the Claim Rejections Under 35 U.S.C. § 103**

Claims 1-5, 9, 10, and 19-21 are rejected under 35 U.S.C. § 103 as being unpatentable over Suzuki *et al.* (U.S. Publication Number 2003/0116057). Applicants respectfully submit that Claims 5 and 6 are allowable over the cited references, for at least the reasons discussed below.

Suzuki teaches a liquid dispersion of metal ultrafine particles comprising:

at least one member selected from the group consisting of alkylamines (e.g. R-NH<sub>2</sub>), carboxylic acid amides (e.g. R-CO- NH<sub>2</sub>) and amino-carboxylic acid salts (e.g. NH<sub>2</sub>-R-COO<sup>-</sup> M<sup>+</sup>) as a dispersant; and

metal ultrafine particles having a particle size ( $d_{\text{particle}}$ ) of not more than 100 nm and individually dispersed in a liquid.

Typically, Suzuki discloses such Au ultrafine particle-containing liquid dispersion of Example 1 prepared by the following process,

wherein the process comprising steps of:

preparing a liquid containing Au ultrafine particles dispersed in methyl oleate according to the evaporation-in-gas technique;

adding laurylamine to the liquid containing Au ultrafine particles in a rate of 0.07 g per 1 g of the Au ultrafine particles present in the liquid containing Au ultrafine particles to thus give a

liquid dispersion in which the primary Au particles were individually and uniformly dispersed in a colloidal state in the methyl oleate;

diluting the liquid dispersion containing the primary Au particles dispersed in a colloidal state in the methyl oleate 10 times with acetone to thus extract the methyl oleate and to precipitate the Au ultrafine particles;

removing the resulting supernatant to collect the precipitated Au ultrafine particles;

further repeating the steps of the dilution and the removal of the supernatant two times (totally three times) to thus substantially remove the methyl oleate; and thereafter,

adding mineral spirit as a solvent to the resulting Au ultrafine particles to give a liquid dispersion containing the Au ultrafine particle individually dispersed in the solvent.

In the liquid dispersion containing the primary Au particles dispersed in a colloidal state in the methyl oleate, a part ( $W_{\text{absorbed amine-0}}$ ) of total content ( $W_{\text{amine-0}} = W_{\text{absorbed amine-0}} + W_{\text{dissolved amine-0}}$ ) of laurylamine is absorbed on the surface of the primary Au particles, whereas the remaining part ( $W_{\text{dissolved amine-0}}$ ) of the total content of laurylamine is dissolved in the methyl oleate.

At the first step of the dilution and the removal of the supernatant, the first supernatant is concluded to comprise the methyl oleate and the remaining part ( $W_{\text{dissolved amine-0}}$ ) of the total content of laurylamine that has been dissolved in the methyl oleate. Therefore, the precipitated Au ultrafine particles to be collected thereafter may comprise substantially no more laurylamine than the part ( $W_{\text{absorbed amine-0}}$ ) of total content of laurylamine that has been absorbed on the surface of the primary Au particles.

At the second step of the dilution and the removal of the supernatant, a part ( $W_{\text{absorbed amine-1}}$ ) of the remaining content ( $W_{\text{absorbed amine-0}}$ ) of laurylamine that has been absorbed on the surface of the Au ultrafine particles may be still absorbed on the surface of the Au ultrafine particles, but the remaining part ( $W_{\text{dissolved amine-1}}$ ) of the remaining content ( $W_{\text{absorbed amine-0}} = W_{\text{absorbed amine-1}} + W_{\text{dissolved amine-1}}$ ) is extracted by diluting 10 times with acetone to be dissolved in the second supernatant.

At the third step of the dilution and the removal of the supernatant, a part ( $W_{\text{absorbed amine-2}}$ ) of the remaining content ( $W_{\text{absorbed amine-1}}$ ) of laurylamine that has been absorbed on the surface of the Au ultrafine particles may be still absorbed on the surface of the Au ultrafine particles, but the

remaining part ( $W_{\text{dissolved amine-2}}$ ) of the remaining content ( $W_{\text{absorbed amine-1}} = W_{\text{absorbed amine-2}} + W_{\text{dissolved amine-2}}$ ) is extracted by diluting 10 times with acetone to be dissolved in the third supernatant. Thus, the resulting Au ultrafine particles may comprise no more laurylamine than the part ( $W_{\text{absorbed amine-2}}$ ) of the remaining content ( $W_{\text{absorbed amine-1}} = W_{\text{absorbed amine-2}} + W_{\text{dissolved amine-2}}$ ) of laurylamine that has been absorbed on the surface of the Au ultrafine particles.

Accordingly, in the resulting liquid dispersion containing the Au ultrafine particles individually dispersed in the solvent (mineral spirit), the remaining (final) content ( $W_{\text{absorbed amine-2}}$ ) of laurylamine contained in the resulting liquid dispersion is considerably lower than the initial content ( $W_{\text{amine-0}}$ ) of laurylamine, which is set in a rate of 0.07 g per 1 g of the Au ultrafine particles.

The Au ultrafine particles present in the resulting liquid dispersion of Example 1 had a particle size of about 8 nm were completely separately dispersed in the solvent. The resulting liquid dispersion of Example 1 was an Au ultrafine particle-containing liquid dispersion having an Au ultrafine particle content of 25 wt% and the viscosity thereof as determined at room temperature found to be 8 mPa·s.

When the resulting liquid dispersion of Example 1 having the viscosity of 8 mPa·s was concentrated through heating in a vacuum to an Au ultrafine particle concentration of 80 wt%, the concentrated liquid dispersion had a viscosity of 40 mPa·s.

Suzuki discloses such Cu ultrafine particle-containing liquid dispersion of Example 3 prepared by the following process,

wherein oleylamine was added to the liquid containing Cu ultrafine particles in a rate of 0.1 g per 1 g of the Cu ultrafine particles present in the liquid containing Au ultrafine particles to thus give a liquid dispersion in which the primary Cu particles were individually and uniformly dispersed in a colloidal state in the ethyl stearate; and

the ethyl stearate was replaced with toluene using acetone by repeating such steps of the dilution and the removal of the supernatant three times.

Accordingly, in the resulting liquid dispersion containing the Cu ultrafine particles individually dispersed in the solvent (toluene), the remaining (final) content ( $W_{\text{absorbed amine-2}}$ ) of

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oleylamine contained in the resulting liquid dispersion is considerably lower than the initial content ( $W_{\text{amine}-0}$ ) of oleylamine, which is set in a rate of 0.1 g per 1 g of the Cu ultrafine particles.

In the case of the Cu ultrafine particle-containing liquid dispersion of Example 3, even though the final content ( $W_{\text{absorbed amine-2}}$ ) of oleylamine contained in the resulting liquid dispersion is considerably lower than the initial content ( $W_{\text{amine}-0}$ ) of oleylamine, which is set in a rate of 0.1 g per 1 g of the Cu ultrafine particles, it was found that most of the Cu ultrafine particles were individually dispersed in the Cu ultrafine particle-containing liquid dispersion, but a part thereof was collected in the form of aggregates (gel-like product).

Therefore, the result of Example 3 clearly suggests that the final content ( $W_{\text{absorbed amine-2}}$ ) of oleylamine contained in the resulting liquid dispersion should be lower than the rate of 0.1 g per 1 g of the Cu ultrafine particles to prevent the Cu ultrafine particles from formation of a gel-like product.

In the paragraph [0020] of Suzuki suggests as follows:

According to the technique of Suzuki, the content of the alkylamine in the liquid dispersion containing metal colloid (metal ultrafine particles dispersed in a colloidal state therein) ranges from about 0.1 to 10 wt% and desirably 0.2 to wt % on the basis of the mass of the metal ultrafine particles.

If the content thereof is less than 0.1 wt %, the metal ultrafine particles (primary metal particles) are not individually dispersed in the liquid, but are present in the form of aggregates (secondary particles formed from the primary metal particles), and thus, the liquid dispersion shows poor dispersion stability. For instance, the aggregates (secondary particles formed from the primary metal particles) may be easily precipitated by warming the dispersion.

On the other hand, if the content exceeds 10 wt %, the resulting liquid dispersion has a high viscosity and ultimately undergoes the formation of a gel-like product.

Accordingly, Suzuki fails to suggest any liquid dispersion in which one or more compounds having the group containing the nitrogen, oxygen or sulfur atom is contained in a total amount of 20 to 50 parts by weight based on 100 parts by weight of said metal nanoparticles.

Thus, Suzuki fails to teach the specific range of the content of dispersant based on the mass of metal ultrafine particles (nanoparticles) to be selected in the claimed dispersion of the

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present application. In order to provide a *prima facie* showing of obviousness under 35 U.S.C. § 103(a), all the claim limitations must be taught or suggested by the prior art. *In re Vaeck*, 947 F.2d 488, 20 U.S.P.Q.2d 1438 (Fed. Cir. 1991). Accordingly, the cited references would not measure up to the currently claimed invention, even if combined, and will not lead to a *prima facie* showing of obviousness.

**Request for Rejoinder**

Applicant has withdrawn Claims 6-8, 11, 12, and 22-26. The claim recites a process for forming an electroconductive layer, and all of the recited element in Claim 1 are clearly limiting on the method as set forth below.

The nonelected invention, i.e., “a process for forming, on a substrate, an electroconductive layer with good conductivity having a fine shape, which is consisting of a sintered product layer of metal nanoparticles using the metal nanoparticle dispersion as claimed in claim 1” is technically equivalent to such invention “a method of using the metal nanoparticle dispersion as claimed in claim 1 for forming, on a substrate, an electroconductive layer with good conductivity having a fine shape, which is consisting of a sintered product layer of metal nanoparticles”. Thus, the claims are believed to be eligible for rejoinder upon allowance of “elected claim.”

Moreover, the technical contribution (inventiveness) of the claimed dispersion is based on the aforementioned characteristic feature that is provided by specific selection of all the components and amounts thereof.

The technical contribution (inventiveness) of the claimed process using the dispersion is based mainly on the aforementioned characteristic feature that is provided by specific selection of all the components and amounts of the dispersion.

Thus, the inventions claimed in Claims of Group I and Claims of Group II relate to a single general inventive concept under PCT Rule 13.1 as those inventions have the same or corresponding special technical features under PCT Rule 13.2.

Accordingly, the client considers that the inventions claimed in Claims of Group I and the inventions claimed in Claims of Group II by no means lack “unity of invention” under PCT Rule 13.1.

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No Disclaimers or Disavowals

Although the present communication may include alterations to the application or claims, or characterizations of claim scope or referenced art, Applicant is not conceding in this application that previously pending claims are not patentable over the cited references. Rather, any alterations or characterizations are being made to facilitate expeditious prosecution of this application. Applicant reserves the right to pursue at a later date any previously pending or other broader or narrower claims that capture any subject matter supported by the present disclosure, including subject matter found to be specifically disclaimed herein or by any prior prosecution. Accordingly, reviewers of this or any parent, child or related prosecution history shall not reasonably infer that Applicant has made any disclaimers or disavowals of any subject matter supported by the present application.

Please charge any additional fees, including any fees for additional extension of time, or credit overpayment to Deposit Account No. 11-1410.

Respectfully submitted,

KNOBBE, MARTENS, OLSON & BEAR, LLP

Dated: January 11, 2012

By:/Karoline A. Delaney/

Karoline A. Delaney  
Registration No. 44,058  
Attorney of Record  
Customer No. 20995  
(949) 760-0404

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